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(54) FAUTEUIL ROULANT MOTORISE
(54) MOTORIZED WHEELCHAIR

(57)

A motorized wheelchair having a frame, with a front, back and opposed sides is disclosed. The frame includes an upper seat mounting portion and at least one rear ground engaging castor wheel. A pair of pivoting lower carriages are provided which are attached to the frame by means of a forward pivot point and a biasing element remote from the forward pivot point. A ground engaging drive wheel is provided for each carriage portion with a motor operatively connected thereto. Also provided are anti-tip wheels which are mounted to the pivoting carriage. In one embodiment the anti-tip wheels are mounted on an arm pivotally mounted to said pivoting carriage. In another embodiment the anti-tip wheels have movable axles to permit them to ride over obstacles. In a further embodiment the main suspension springs are double acting to permit the anti-tip wheels to pivot up over obstacles as well as down to prevent tipping during stopping.

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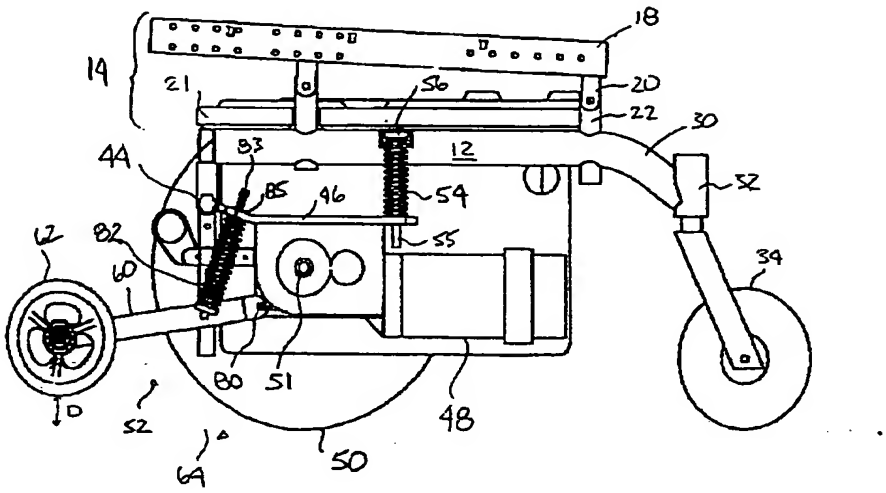
(54) **FAUTEUIL ROULANT MOTORISE**
(54) **MOTORIZED WHEELCHAIR**



(57) A motorized wheelchair having a frame, with a front, back and opposed sides is disclosed. The frame includes an upper seat mounting portion and at least one rear ground engaging castor wheel. A pair of pivoting lower carriages are provided which are attached to the frame by means of a forward pivot point and a biasing element remote from the forward pivot point. A ground engaging drive wheel is provided for each carriage portion with a motor operatively connected thereto. Also provided are anti-tip wheels which are mounted to the pivoting carriage. In one embodiment the anti-tip wheels are mounted on an arm pivotally mounted to said pivoting carriage. In another embodiment the anti-tip wheels have movable axles to permit them to ride over obstacles. In a further embodiment the main suspension springs are double acting to permit the anti-tip wheels to pivot up over obstacles as well as down to prevent tipping during stopping.

ABSTRACT OF THE DISCLOSURE

A motorized wheelchair having a frame, with a front, back and opposed sides is disclosed. The frame includes an upper seat mounting portion and at least one rear ground engaging castor wheel. A pair of pivoting lower carriages are provided which are attached to the frame by means of a forward pivot point and a biasing element remote from the forward pivot point. A ground engaging drive wheel is provided for each carriage portion with a motor operatively connected thereto. Also provided are anti-tip wheels which are mounted to the pivoting carriage. In one embodiment the anti-tip wheels are mounted on an arm pivotally mounted to said pivoting carriage. In another embodiment the anti-tip wheels have movable axles to permit them to ride over obstacles. In a further embodiment the main suspension springs are double acting to permit the anti-tip wheels to pivot up over obstacles as well as down to prevent tipping during stopping.

Title: **MOTORIZED WHEELCHAIR**

FIELD OF THE INVENTION

This invention relates to the field of wheelchairs and particularly to wheelchairs which are motorized and therefore self propelled. Most particularly, this invention relates to those motorized wheelchairs which are characterized by having drive wheels located generally under the centre of the weight of the wheelchair occupant, or towards the front of the wheelchair.

BACKGROUND OF THE INVENTION

Wheelchairs have been known and used extensively by invalids for many years. More recently, improvements in electric motor and battery design have led to more motorized wheelchair designs. Motorized wheelchairs are ones which include a power source, such as a battery, and drive motors powered by the power source, where the drive motors are operatively connected to ground engaging drive wheels located on the wheelchair.

A traditional wheelchair design includes larger rear wheels and smaller swivelling front castor wheels. This design is appropriate for manual wheelchairs for a number of reasons. Firstly, manual wheelchairs are pushed by a person walking behind the wheelchair, by means of rearwardly extending handles located at the top of the back seat rest of the wheelchair. The large rear wheels add stability as the wheelchair is pushed. Having smaller front swivelling castor wheels makes the wheelchair more manoeuvrable when pushed from the rear. Lastly, having larger rear wheels means that the wheel rims are accessible to the wheelchair occupant's arms, permitting self propulsion by arm power.

However, the trend towards modern motorized wheelchairs removes some of the advantages of the combination of large rear wheel and

smaller front castor wheel design. Most particularly, in a motorized wheelchair, there is no need to have the wheelchair wheel rims accessible. Lastly, having pivoting front wheels when the wheelchair is being driven by rear wheels extends the turning radius of the wheelchair making it less manoeuvrable.

Therefore, more recently, there have been proposed a number of front wheel and midwheel drive wheelchair designs. In the new designs, ground engaging drive wheels, powered by electric motors or the like, are placed generally under the centre of the seat of the wheelchair to maximize traction for the drive wheels. Rear pivoting castor wheels are provided for stability.

However, there is a problem with such midwheel designs. It is not uncommon to need to stop a motorized wheelchair suddenly. This may occur by reason of a loss of power, or, by reason of a need for preventing an accident. This sudden stop creates a forward moment about the ground engaging midwheels, and in the absence of countermeasures would cause the wheelchair to tip forward. Therefore, midwheel design wheelchairs require forwardly extending anti-tip devices which may take the form of a bar for example, having at its free end an anti-tip wheel.

Developing a proper anti-tip device is difficult. If the anti-tip wheel is raised above the riding surface, the occupant of the wheelchair tends to feel the wheelchair rocking forwardly when suddenly stopping during deceleration as the rear castor wheel lifts off the ground and the front anti-tipping wheel contacts the ground. Consequently, some manufacturers have provided anti-tip wheels which ride in contact with the ground engaging surface, or just above the ground engaging surface to minimize the rocking action during deceleration. This is problematic however because the ground engaging anti-tip wheels make it very difficult to manoeuvre the wheelchair over uneven ground such as curbs and sidewalks. However, raising the anti-tip device above the riding surface creates the unwanted rocking motion.

SUMMARY OF THE INVENTION

What is desired is an anti-tip structure for a midwheel drive wheelchair which prevents unwanted rocking motion while at the same time rides sufficiently high above the riding surface so as to reduce problems on uneven surfaces. Most preferably, such a wheelchair would provide such an anti-tip mechanism in association with power driven ground engaging midwheel drive wheels. Therefore, according to one aspect of the present invention there is provided a motorized wheelchair comprising:

a frame having a front, a back and opposed sides, said frame comprising an upper seat mounting portion and at least one rear ground engaging castor wheel;

a pair of pivoting lower carriage portions, said pivoting lower carriage portions each being pivotally mounted to said frame by a respective pivot located towards the front of said frame;

a biasing element extending between each of said carriage portions and said frame remote from said pivotal mountings;

a ground engaging drive wheel on each of said pivoting carriage portions;

a motor means mounted to each of said pivoting carriage portions and operatively connected to said ground engaging drive wheels for driving each of said ground engaging drive wheels; and

anti-tip means, mounted to each said pivoting carriage portions and extending forwardly therefrom, said anti-tip means comprising an anti-tip arm having an anti-tip wheel proximate to a free end.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will now be made to the following drawings which depict a preferred or preferred embodiments of the invention, by way of example only, and in which:

Figure 1 is an isometric view of a wheelchair base according to the present invention;

Figure 2 is a side view of the wheelchair base of Figure 1 along lines 2-2 of Figure 1 according to the present invention;

Figure 3 is a side view of the wheelchair according to Figure 2, during deceleration;

Figure 4 is a close up side view of a front anti-tip wheel according to a further aspect of the present invention; and

Figure 5 is a close up side view of a front anti-tip mechanism according to a further aspect of the present invention; and

Figure 6 is a view of a complete wheelchair assembly according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The wheelchair base 10 according to the present invention is shown in Figure 1. The wheelchair base 10 includes a base frame 12 which includes a seat mounting portion 14 and a pivoting drive and carriage portion 16. The seat mounting portion 14 includes a seat frame 18, which attaches to frame 12. U-shaped attachment ears 20 extend down from the seat frame 18, and are attached to short posts 22 extending up from the frame 12. Extending across the front of frame 12 is a rectangular tube 21. A similar tube extends across the back. The battery box 19 shown in ghost outline and lid 23 are supported in the base frame 12. The battery box 19 is sized and shaped to house conventional wheelchair batteries, and is preferably made from moulded plastic. Extending rearwardly from the frame element 12 is a curved mounting arm 30 having a castor mount 32 for rear castor wheel 34.

Also shown in Figure 1 is the pivoting drive and carriage portion 16. As will be appreciated by the following description, in the most preferred embodiment each side of the wheelchair 10 includes its own main drive wheel, each of which is independently driven and suspended. Thus, while reference is made herein to carriage portion 16, it will be appreciated that there are identical carriage portions 16 on each side of the wheelchair.

The wheelchair frame 12 includes a front indicated generally at 40, and a rear indicated generally at 42. As shown in Figure 2, the carriage portions 16 are attached to the base frame 12 by a pivoted connection, shown at 44. The carriage portions 16 include a frame element 46, a motor 48, a ground engaging drive wheel 50 and an anti-tip mechanism indicated generally at 52. It will be appreciated that there are two ground engaging drive wheels 50, one of each of said drive wheels 50 being mounted on each side of the wheelchair 10.

As can be seen in Figure 1, the pivot 44 is mounted towards the front 40 of the frame. In Figure 2, remote from the pivot 44 is provided a main suspension spring at 54 extending between the carriage portion 16 and base frame 12.

It can be now appreciated that the preferred location for the rotational axis (or axle 51) of the ground engaging drive wheel 50 is generally in front of the centre of the seat frame 14. To maximize the ground engaging contact, it would be preferable to optimize the location of the ground engaging drive wheels exactly under a centre of gravity of the person occupying a seat (not shown) mounted on said seat frame 14. However, for general stability reasons, it is preferred to mount the ground engaging drive wheels slightly forward of the exact centre of gravity. This permits the ground engaging drive wheels to carry a substantial portion of the weight of the occupant of the wheelchair (improving traction), without making the wheelchair overly tippy by being balanced on a single point. In other words, it is most preferred to have between 10% to 20% of the load carried by the rear castor wheel.

It can now be appreciated, that by mounting the carriage portion 16 by a pivot point 44 located forwardly, and providing a pair of ground engaging drive wheels 50 rearwardly of this position, that the weight of a passenger on the wheelchair, will tend to rotate the rear of carriage portion 16 upwardly against spring 54. Therefore, according to the present invention the preferred configuration is to have a forwardly oriented pivot

point 44, a generally centrally located pair of ground engaging driving wheels 50, slightly forward of centre for stability reasons, and a spring or biasing means 54 remote from the pivot point 44, extending between the carriage portion 16 and the base frame 12. This configuration adds comfort to the occupant, since their weight is essentially carried on the spring 54, which provides a smooth ride with independent suspension.

As shown in Figure 2 the biasing element 54 is provided with a threaded rod 55 and an adjustment nut 56 at a top end. In this way, the biasing element can be preloaded or compressed to provide a certain predetermined spring force. The greater the preloading, the less the compression when a person sits on the wheelchair. Thus, very light occupants need less preloading, whereas very heavy (over 250 lbs.) may need more preloading of the spring. Adequate results have been achieved with spring constant that permits factory setting of the preload compression so as to permit a range of weights up to about 250 lbs. Above this weight, it may be necessary to alter the spring constant and substitute a sturdier spring.

Referring now to the anti-tip mechanism 52, it is characterized by a forwardly extending arm 60 having an anti-tip wheel 62. As shown in Figure 2, the anti-tip wheel 62 is typically above the ground surface 64 by a distance D when a person is seated in the wheelchair. To improve the manoeuvrability of the present motorized wheelchair, it is preferred to make the distance D sufficiently large that surface disconformities such as cracks, bumps, and other smaller obstacles, and the shock therefrom, are not transmitted to the wheelchair occupant during motorized driving. Most preferably, distance D is adjustable as described below but typically will be in the range of 1 inch to 2½ inches. However, according to the present invention, there is also provided a smooth transition (i.e. without rocking) upon sudden braking or the like. It can now be understood how the present invention provides a smooth transition upon braking while simultaneously preventing tipping.

Referring now to Figure 3, when an occupant first sits in the present invention, the weight is generally taken up by the suspension spring or biasing means 54. In the event of a sudden deceleration, the momentum effect of the passenger will be to create additional force downwardly on the wheelchair at the front edge. This will compress the biasing element 54 more, and cause the front 40 of the wheelchair to subside, essentially, tilting forwardly slightly.

Simultaneously with this, if the motor has locked with the drive wheel, the forward momentum of the wheelchair and occupant will continue to rotate the ground engaging wheel 50. Thus, the rear motor will be urged by the forward momentum of the wheelchair to rise upwardly as the ground engaging wheels are torqued to a stop. This again compresses the spring 54, and further lowers the front edge of the wheelchair. This is shown in Figure 3, where the normal riding position is shown in said outline, and the full braking position is shown in dotted outline. In this drawing D is broken down into two components D_1 and D_2. D_1 represents the amount the seat lowers during stopping, by reason of the motor rotating against biaser 54. D_2 represents the amount the anti-tip wheel must rotate to contact the ground, shown in dotted outline as 64^1. It will be appreciated that the actual ground level does not change, but for ease of illustration, this Figure separates out the distances by seat subsidence and rotation of the anti-tip means downwardly.

As can be seen in the drawings, the anti-tipping device 52 is a forward extension of the pivoting carriage portion 16. The movement of the end of the anti-tipping device 60 during sudden stopping, and in particular the anti-tipping wheel 62 can now be understood. The rotation of the drive wheel 50 is defined by a first radius, shown as R1 about the pivot point 44. Rotation of the anti-tipping wheel 62 is defined by a second radius R2 from the pivot point 44. It will be appreciated that if the anti-tip wheel is located directly under the pivot point 44, rotation will move the anti-tip wheel 62 tangentially backwardly, but not downwardly. It is preferred to orient the

anti-tip wheel 62 significantly forwardly of the pivot point 44, so that rotation about the pivot point 44 includes a significant downward component to the movement. A restraint on the forward location of the anti-tip wheel is overall wheelchair length which is preferred to be as short as possible. Good results are achieved when the anti-tip wheel 62 is centred between 8 to 14 inches ahead of the pivot point 44 and most preferably about 10 to 12 inches. On a sudden stop, this forward positioning results in the pivoting downwardly of the anti-tipping device 60. This downwardly pivoting, quickly moves the anti-tipping device into contact with the ground before any rocking is detected by the rider of the wheelchair. In other words, the rear castor wheel does not leave the ground during this deceleration and there is no rocking. Most preferably therefore, the present invention provides a combination of spring biasing, and pivot arm rotation to cause the anti-tip wheel to contact the ground prior to the rear castor wheel leaving the ground.

It will be appreciated that to achieve this result requires careful tuning of the spring 54, with the radius R1 and R2. For example, if R2 is twice R1 in length, then it will displace, along a circular arc, an amount twice the length of the displacement of axis 51 along R1. The amount of displacement is a function of the weight or force imposed during deceleration, together with the spring constant K of the spring 54. Essentially what is desired therefore is for the anti-tip wheel 62 to contact the ground prior to any tipping which would lift rear castor wheel 43 off of the ground. Of course, once braking is completed, the forces will be spent and the anti-tip wheel will rise up off the ground to the normal running position.

Returning to Figure 2, it will be noted that there is an additional pivot point 80, and a further suspension spring 82, extending between the anti-tipping arm 60 and the pivoting carriage 16. This is one way of providing a means to permit the anti-tip wheel to rise up over obstacles without lifting the driving wheels off the ground. Also, similar to biasing element 54, a threaded rod 83 is provided with suspension spring 82, which

is threaded through motor arm 46 which rotates about pivot point 44. Rotating a nut 85 on the threaded rod 83 has the effect of compressing or loosening spring 82, which in turn has the effect of raising and lowering anti-tip wheel 62, thereby changing the distance D. Individual passengers may have individual preferences for an acceptable D required to limit rocking as described above. Depending upon the weight of the occupant, the distance D will be higher (less weight) or lower (more weight). This adjustment permits the height D to be preset for the end user when the end user is in the wheelchair.

Figure 4 shows a further aspect of the present invention relating to the anti-tip structure 52. In this Figure the wheel 62 is shown with an axle 100, which is housed in a slot 102. The slot includes a notch at 104, and is formed in plate either attached to or made integral with arm 60. Figure 4 also shows a strike line 110 and a spring 112 which can be now be explained.

Even with the pivot arm 60, there can be difficultly in getting the anti-tip wheels above obstacles. By attaching the arm 60 to the motor mount 45, the present invention teaches a greater normal D than is presented in the prior art. However, overcoming higher obstacles, without losing secure riding and stopping (i.e. traction) remains an issue.

The spring 112 biases the axle 100 into a normal running position within notch 104. One end of the spring 112 is attached to axle 100, and the other end is fixed to the plate at 114. Notch 104 is sized and shaped to retain the axle 100 within the notch for any force generated behind strike line 110, such as F_1 as shown. This direction of force would be generated during stopping motion for example.

On the other hand, for any force generated ahead of the strike line 110, such as F_2, the slot 100 is sized to permit the axle 100 to be unseated allowing the axle to ride up the slot to a second, raised position shown as 100^1. In this position the spring is compressed as shown at 112^1. An example of an F_2 force would be the reaction force caused by bumping

into a curb or the like. Thus it can be seen that the present invention contemplates a slot, which has a height H, which adds to the height of an obstacle surmountable by the present invention anti-tipper 52.

Figure 5 shows a further aspect of the present invention to permit the anti-tip wheel 62 to rise over obstacles. This aspect relates to making main spring 54^1 double acting as described below. As shown, the motor pivot arm 46 includes a pair of right angle elbows 150 and 151 an the end remote from pivot 44. Thus, rather than intersecting the spring 54^1 at the bottom edge 152, the end 154 of the motor pivot arm 46 intersects the spring 54^1 at point 156, about one third of the way up from the bottom 154. In addition, rather than the front anti-tip pivot arm 60 being sprung to the motor pivot arm 46, it is attached by a fixed link 160. The link 160 includes a threaded portion 162 and adjustment nuts 164, 165, so that the height D may be adjusted by increasing or shortening the length of the link 160, similar to what was previously described. While the spring 54^1 is shown as being the same above and below intersection point 156, the present invention comprehends making the spring 54^1 out of two separate spring portions 170, 172, which can be adjusted to react differently, to develop the desired movement of the anti-tip wheel 62. One way this can be adjusted, is to provide different spring constants. Thus, the portion 170 can be made stiffer, to provide a smooth suspension ride, and the portion 172 can be made more flexible, to permit the anti-tip wheel 62 to ride over obstacles. Each section is preloaded by separate adjustment nuts 171, 173 as shown, so even if the same spring 54^1 is used, each could be separately preloaded to provide different displacements under the same force.

As can now be understood, double acting main spring 54^1 can support the weight of a user under compression, during ordinary use, and, extend to permit the anti-tipping wheel to raise up, when the anti-tip wheel encounters an obstacle in front of the wheelchair.

Figure 6 shows a fully assembled wheelchair according to the present invention. As shown there is a seat back 200 and a seat cushion

202 which are attached to the seat frame 18. Also shown are arms 204 and 206 with arm pads 208 and 210 respectively. Also shown is a control box 212, with a joystick 214 attached by means of a mount 216.

It can now be appreciated that the attachment between the seat frame 18 and the main frame 12 facilitates the ease of use of the wheelchair 10. Specifically, the front U-shaped attachment ears 20 latch into the front posts 22, while the rear attachment ears 20 are pivoted into rear attachment posts 22. In this way, a latch (not shown) can be released to allow the seat frame to be pivoted rearwardly about the rear ear/post attachment. This provides easy access to the battery box 19 previously described. Those skilled in the art will realize that changing the batteries is required from time to time and this easy access facilitates this.

Below the seat frame is cowl 220 which is sized and shaped to cover the main wheels 50, and extend out towards the rear castor wheels 34. A forward U-shaped frame element 222 is provided, from which is suspended a foot tray 224. A bearing pad (not shown) is carried by the foot tray. Alternately, the wheelchair 10 could be provided with individual foot stirrups of a known configuration.

The present invention comprehends mounting the anti-tip mechanism to the pivoting lower carriage portions, to more quickly engage the anti-tip mechanism with the ground during sudden stopping. This permits the anti-tip wheel to be carried higher above the ground than if it were connected to the frame. In addition, three aspects of the invention comprehend additional mechanisms for improving the ability of the anti-tip wheels to surmount obstacles during normal use, without substantially detracting from the performance of the anti-tip wheels during sudden stopping. These additional aspects include mounting the anti-tip wheels on pivoting anti-tip arms, which are spring-loaded to the pivoting lower carriage; providing a moveable axle means for the anti-tip wheel on the anti-tip arm; and providing a double acting main suspension spring for each carriage portion, which permits the carriage portion to pivot in both directions relative

to the pivot point, thereby allowing the anti-tip wheel to rise over obstacles, as well as pivot down into contact with the ground during stopping.

It will be appreciated by those skilled in the art that various modifications and alterations can be made to the invention without departing from the broad scope of the present invention. For example, while reference has been made to a first biasing element 54 in the form of a coil spring, other forms of deformable supports, such as pneumatic pistons, rubber pads and the like might also be suitable, provided that an appropriate amount of deformation occurs during deceleration to permit anti-tipping wheel to engage the ground prior to rear castor wheel being disengaged from the ground.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A motorized wheelchair comprising:

a frame having a front, a back and opposed sides, said frame comprising an upper seat mounting portion and at least one rear ground engaging castor wheel;

a pair of pivoting lower carriage portions, said pivoting lower carriage portions each being pivotally mounted to said frame by a respective pivot located towards the front of said frame;

a first biasing element extending between each of said carriage portions and said frame remote from said pivotal mountings;

a ground engaging drive wheel on each of said pivoting carriage portions;

a motor means mounted to each of said pivoting carriage portions and operatively connected to said ground engaging drive wheels for driving each of said ground engaging drive wheels; and

anti-tip means, mounted to each said pivoting carriage portions and extending forwardly therefrom, said anti-tip means comprising an anti-tip arm having an anti-tip wheel proximate to a free end.

2. A motorized wheelchair according to claim 1 wherein said anti-tip means includes a means for permitting the anti-tip wheel to rise up over an obstacle in the path of the wheel chair.

3. A motorized wheelchair according to claim 2 wherein said means for permitting the anti-tip wheel to rise up over said obstacle comprises a pivotal attachment between said anti-tip arm and said pivoting carriage portion and a second biaser extending between the anti-tip arm and said lower pivoting carriage portion.

4. A motorized wheelchair according to claim 3 wherein said second biaser urges said pivot arm to a lower position against a stop.

5. A motorized wheelchair according to claim 4 wherein said anti-tip means further includes an adjuster for adjusting the height of said anti-tip wheel above the ground.

6. A motorized wheelchair according to claim 2 wherein said anti-tip wheel is mounted to said anti-tip arm by means of an axle and said means for permitting said anti-tip wheel to rise up over said obstacle comprises a moveable axle mounting for said anti-tip wheel axle on said anti-tip arm.

7. A motorized wheelchair according to claim 6 wherein said moveable axle mounting comprises a slot and a wheel axle biaser, which urges said moveable axle mounting into a lower position in said slot.

8. A motorized wheelchair according to claim 7 wherein said slot includes a stop and said wheel axle biaser urges said moveable axle into engagement with said stop to inhibit said axle from moving off said stop.

9. A motorized wheelchair according to claim 8 wherein said stop is sized and shaped to retain said moveable axle during forward tipping of the wheelchair, during stopping and to permit said moveable axle to unseat from said stop during impact with an obstacle in front of said wheelchair.

10. A motorized wheelchair according to claim wherein said anti-tip means comprises a link element between said anti-tip arm and said pivoting lower carriage portion, and wherein said first biasing element acts in both the up and down directions on said pivoting motor arm.

11. A motorized wheelchair according to claim 10 wherein said first biasing element is formed from a first portion and a second portion and said motor pivot arm intersects said first biasing element between said first and said second portion.

12. A motorized wheelchair according to claim 11 wherein at least one of said first and second portions of said biasing element can be preloaded by an adjuster.

13. A motorized wheelchair according to claim 11 wherein both of said first and said second portions of said biasing element can be preloaded by separate adjusters.

14. A motorized wheelchair according to claim 11 wherein said first and second portions of said first biasing element have different spring constants.

15. A motorized wheelchair according to claim 12 wherein at least one of said first and second portions of said first biasing element may be adjusted to a different preloading amount from the other of said first and second portion of said first biasing element.

16. A motorized wheelchair according to claim 10 wherein said link element is adjustable to raise and lower the anti tip wheel relative to the ground.

17. A motorized wheelchair according to claim 10 wherein said pivoting lower carriage portion includes a pivot arm and said pivot arm includes a pair of elbows to permit said pivot arm to intersect said first biasing element between said first and second portions.

18. A lower carriage portion for a wheelchair comprising:

a motor arm;

a pivot connection at one end of said motor arm for pivotal connection to a frame of said wheelchair;

a motor carried by said motor arm;

a take off gear for connecting said motor to said drive wheel;

a first biasing element remote from said pivot for attaching between said motor arm and said frame of said wheel chair; and

an anti-tip means extending past said pivot connection,

wherein, upon said first biasing element compressing, said carriage portion pivots about said pivot connection, said anti tip means also pivots.

19. A lower carriage portion for a wheelchair as claimed in claim 18 wherein said anti-tip means further includes an anti-tip arm and a second biasing element extending between said anti-tip arm and said carriage portion, wherein upon said second biasing element compressing, said anti-tip means pivots relative to said carriage portion.

20. A lower carriage portion for a wheelchair as claimed in claim 18 wherein said anti-tip means further includes an anti-tip wheel mounted on an end of an anti-tip arm, and said anti-tip wheel includes a moveable axle to permit said anti-tip wheel to rid up over obstacle in the path of said wheelchair.

21. A lower carriage portion for a wheelchair as claimed in claim 18 wherein said first biasing element further includes a first portion and a second portion and said motor arm intersects said first biasing element between said first and second portions wherein said anti-tip means can pivot in both up and down directions relative to said frame of said wheelchair.

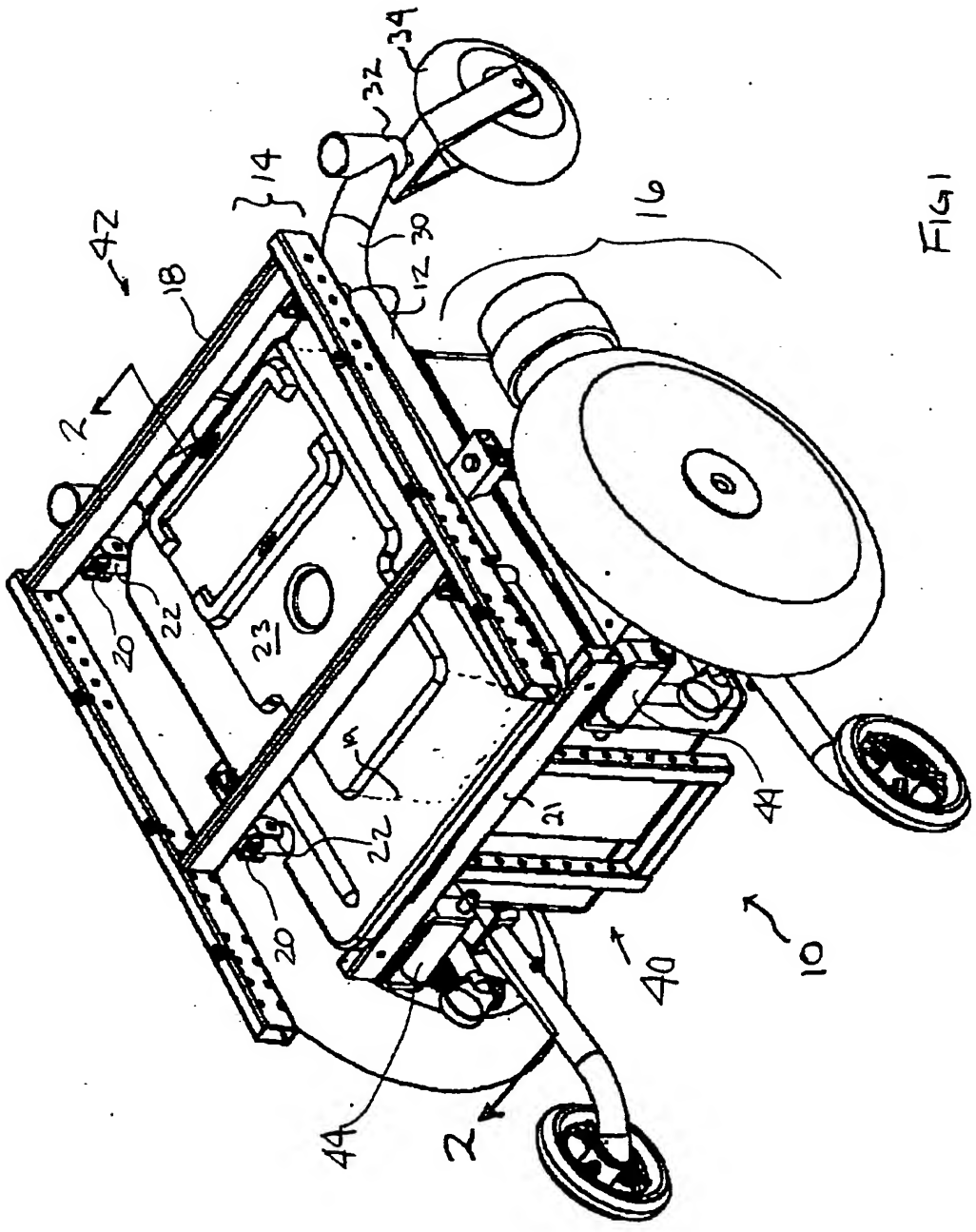


Fig 1

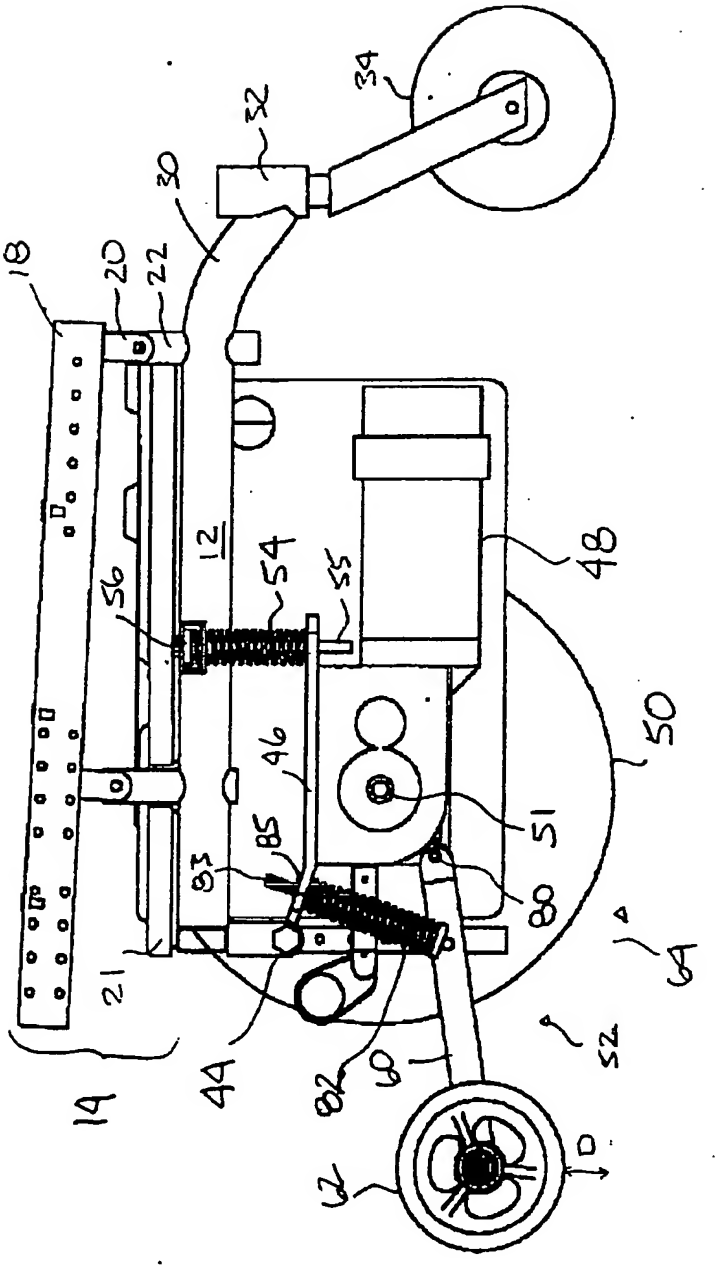

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FIG 2

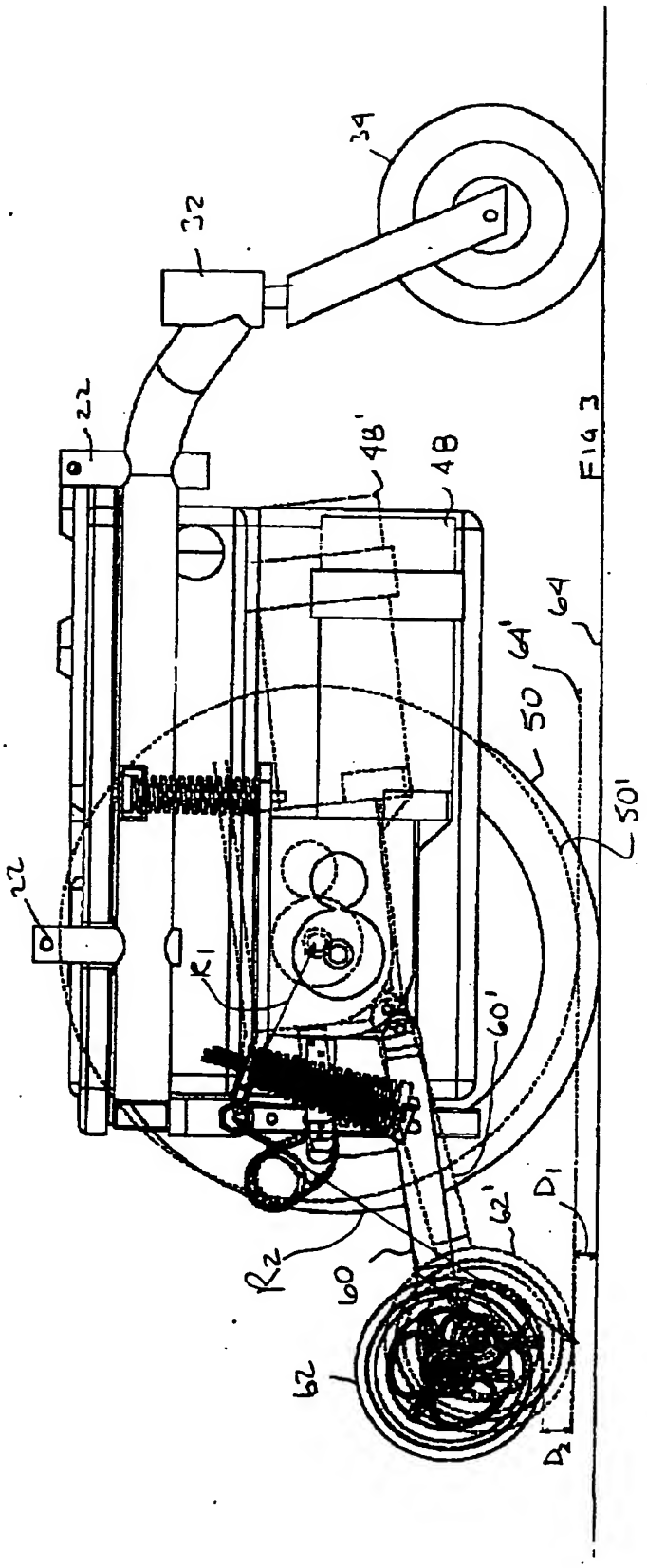

FIG 3

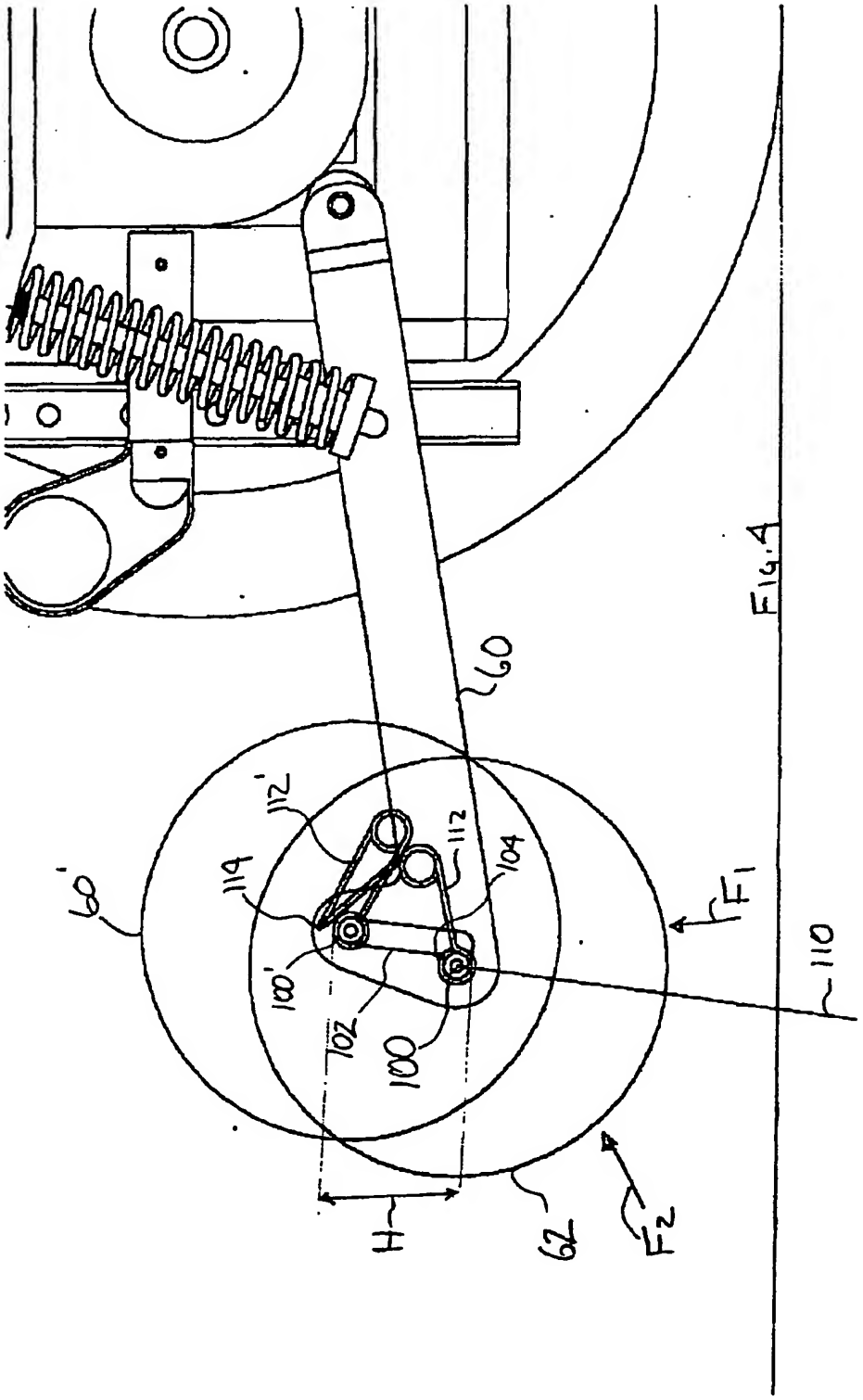

Fig.4

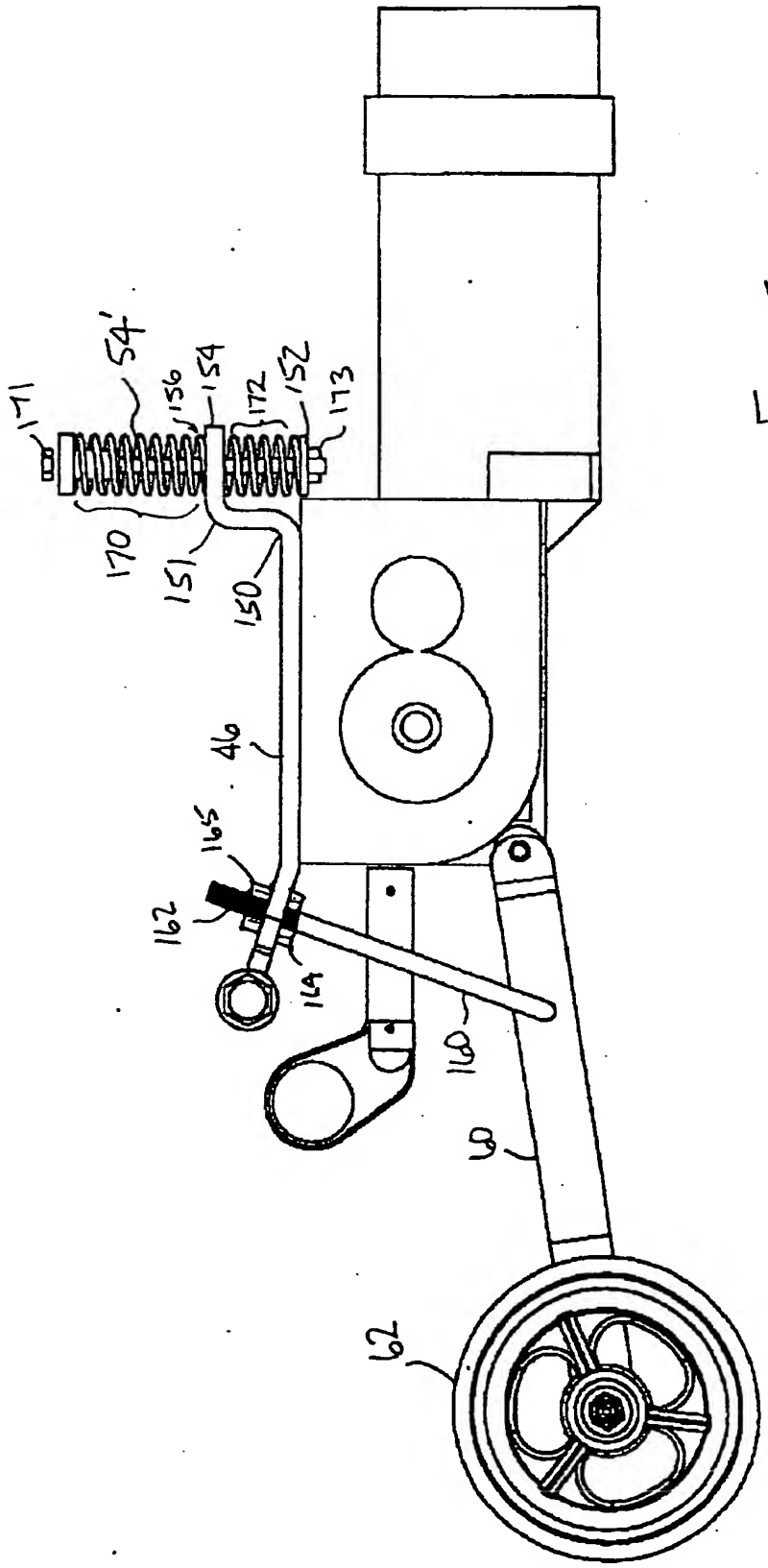

FIG 5

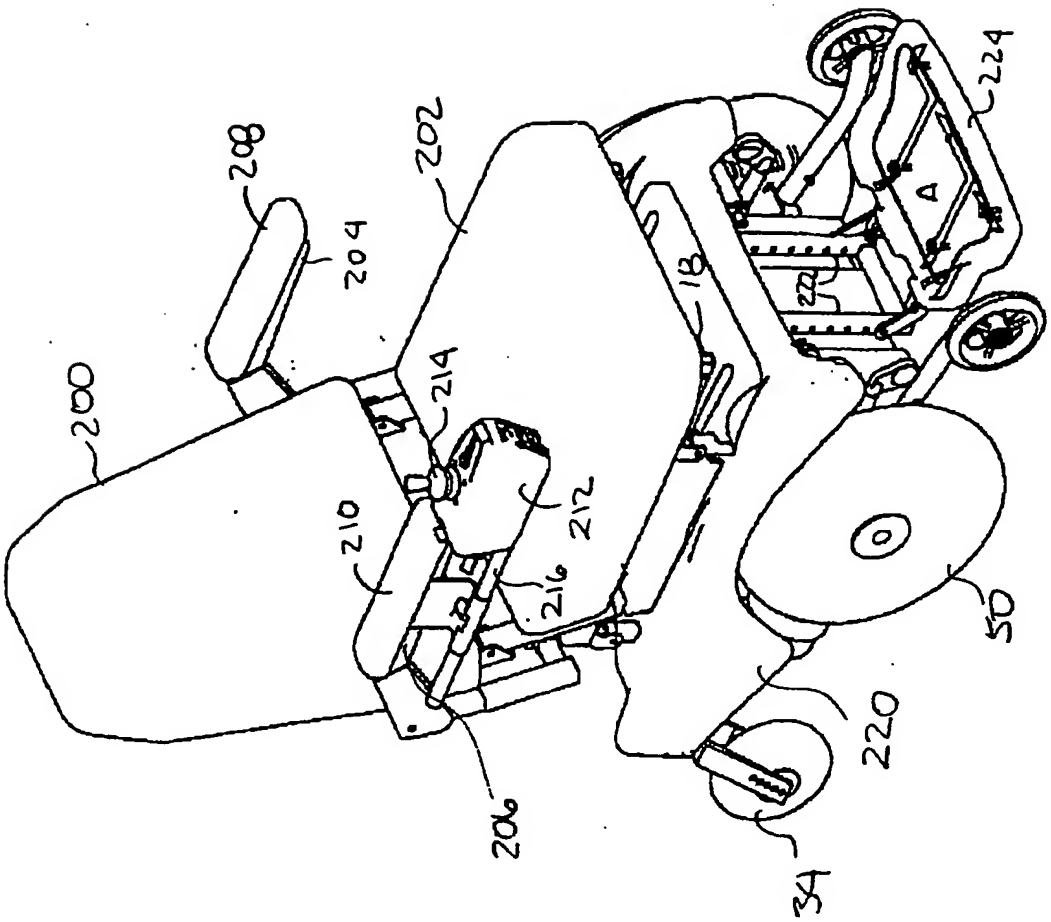

Fig. 6